



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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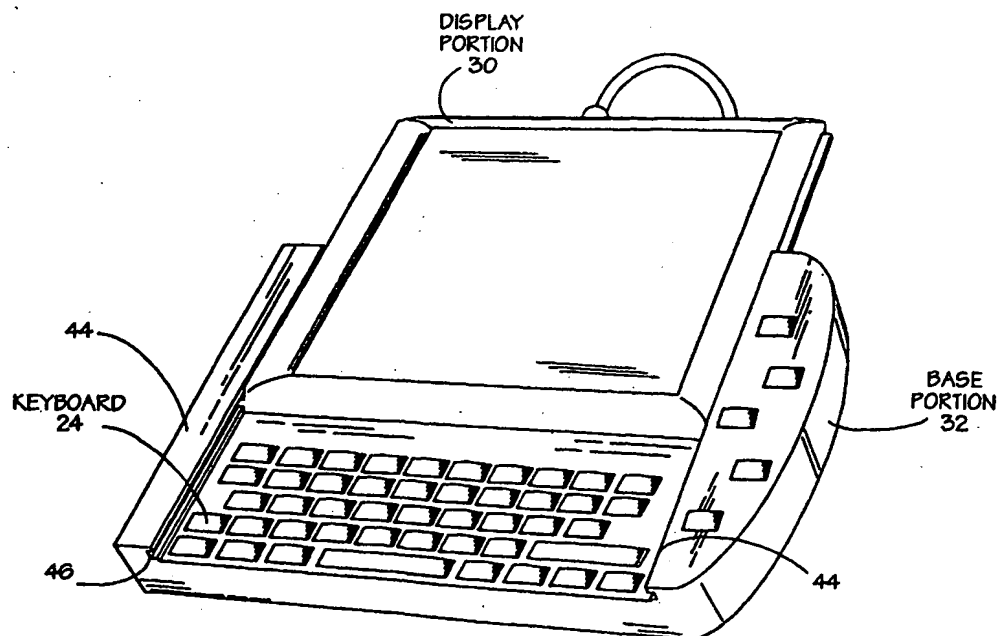
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(54) Title: **ELECTRONIC DEVICE WITH HIDDEN KEYBOARD**

## (57) Abstract

A device as shown in the figure, including a keyboard (24) and a display (30). The keyboard allows entry of data into the device, and the display provides an information output. The display has a first position in which the display hides the keyboard, and the display has a second position in which the keyboard is exposed to allow entry of data via the keyboard. The display is visible to the user in both the first position and the second position.

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## ELECTRONIC DEVICE WITH HIDDEN KEYBOARD

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

The described invention relates to an electronic device providing a display output and allowing input via a keyboard or keypad.

#### 2. Description of Related Art

Electronic devices employing display outputs include personal digital assistants (PDA's), palm PC's (such as the Palm Pilot device manufactured by 3COM), still and video cameras, two-way pagers, and so forth. In many cases, a few navigation buttons are used to allow a user to maneuver through displayed data. These electronic devices, however, may have real estate (i.e., area) limitations that may not allow for both a keyboard/keypad and a display output. Handheld devices especially may have these real estate constraints.

If a device has real estate constraints and needs both a keyboard/keypad and a display, a compromise is made. One solution is to use a touch screen LCD to allow the input of text as well as to display images. If keyboard input is desired, a virtual keyboard is displayed on the touch screen LCD. A user can then input information via the virtual keyboard. However, this limits the portion of the touch screen LCD that can be used for displaying images (because a virtual keyboard is also being displayed).

A hinged device with a display output on one side and a keyboard on the other side is an alternate solution. This type of device allows both input from the keyboard, and simultaneous display of data and/or images. However, when the hinged device is closed, the user can no longer view displayed information from the display output.

### SUMMARY OF THE INVENTION

A device includes a keyboard and a display. The keyboard allows entry of data into the device, and the display provides an information output. The display has a first position in which the display hides the keyboard, and the display has a second position in which the keyboard is exposed to allow entry of data via the keyboard. The display is visible to the user in both the first position and the second position.

### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows one embodiment of an electronic device in a read only mode.

Figure 2 shows one embodiment of an electronic device in a full I/O mode.

Figure 3 shows one embodiment of the display portion of the present invention.

Figure 4 shows one embodiment of a base portion corresponding to the display portion of Figure 3.

Figure 5 shows an embodiment of electrically connecting the display portion to the base portion of the electrical device using a flexible connector.

Figure 6 shows an embodiment of mechanically connecting the display portion to the base portion using a sliding mechanical guide.

Figures 7A and 7B show an embodiment of a device that includes a display portion coupled to a base portion via a rod that allows the display portion to rotatably move to reveal the keyboard.

Figures 8A – 8C show different views of an embodiment of mechanically connecting the display portion to the base portion using an arm. Figures 8A and 8B are side views. Figure 8C is a top view.

#### DETAILED DESCRIPTION

An electronic device having a display that is capable of concealing a keyboard is disclosed. In a “read mode,” the display is visible to a user, but the display conceals the keyboard. This mode allows easy access to data and images via the display. When the display is moved to a “full I/O (input/output) mode, the display is still visible to a user, but the display no longer conceals the keyboard. This mode allows the user to input information via the keyboard as well as view information output from the display.

Figure 1 shows a prior art example of an electronic device 10 having a display 20 and maneuver buttons 22. A user is able to view information on the display 20, and the maneuver buttons 22 allow limited input for scrolling through data. The information displayed may comprise pictorial information (images) or textual information (names, appointments, etc.)

The “read mode” of the present invention acts the same as that of the prior art Figure 1. This read mode allows the user to conveniently access information and images from the electronic device 10.

Figure 2 shows one embodiment of the present invention in its “full I/O mode.” This mode is achieved by moving the display 20 so that it no longer conceals a keyboard/keypad 24. The keyboard/keypad 24 may provide a full character set including all letters, numbers and special characters such as that of a typewriter or

computer keyboard; or the keyboard/keypad 24 may provide a simplified character set such as the keypad of a touch-tone telephone. The term keyboard will be used to denote a full character set keyboard, or any subset of a full character set keyboard in which selection of a particular button corresponds to the input of a character (alphanumeric or special character). In both the read mode and the full I/O mode, the display output is visible to the user.

Figure 3 shows one embodiment of the display portion 30 of the present invention, and figure 4 shows one embodiment of a corresponding base portion 32 of the present invention. In this embodiment, the display portion 30 and base portion 32 include several electrical contacts 40 that provide an electrical connection between the display portion 30 and the base portion 32.

In one embodiment, the display portion 30 is a liquid crystal display (LCD), and the base portion 32 houses a processor, memory, and power source (batteries). However, in an alternative embodiment, the processor, memory and/or power source could be moved into the display portion. The power source could also be provided externally.

In one embodiment, the display portion 30 is coupled to the base portion 32 via a serial connection, such as an SPI\* serial bus or an I<sup>2</sup>C\* serial bus, which are well-known serial connections. (SPI is a serial bus developed by Motorola Incorporated as a peripheral interconnect standard. I<sup>2</sup>C is a serial bus developed by Philips Semiconductor.)

Figure 5 shows another embodiment of electrically connecting the display portion 30 to the base portion 32 of the electrical device 10. In this embodiment, a flexible connector such as a ribbon cable 42 is connected between the display portion 30 and the base portion 32. A mechanical guide 46 such as grooves along the edges 44 of the base portion 32 (or display portion 30) is used to allow the display portion 30 to slidably move between the read mode and the full I/O mode. Rollers or ball bearings may be employed to allow freer movement within the mechanical guides. In one embodiment, the topside of the display portion 30 raises as its bottomside is moved within the mechanical guides to reveal the keyboard, as shown in Figure 6.

Figures 7A and 7B show an alternative embodiment of a device that includes a display portion 30 coupled to a base portion 32 via a rod 50 that allows the display

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portion 30 to rotatably move to reveal the keyboard 24. The display portion 30 may employ a curved side to allow rotatable movement. An electrical connection between the display portion 30 and the base portion 32 may be routed through the rod 50.

Figures 8A-8C show an alternative embodiment of mechanically connecting the display portion 30 to the base portion 32 using an arm 60. The arm 60 is bendable and swivels in various directions to allow the display portion 30 to be placed in different positions. An electrical connection from the display portion 30 to the base portion 32 is routed internal to the arm 60.

Figure 8A shows a side view of the device having extendable arm 60. In its read mode, the device's display portion 30 fits within the base portion 32 as shown by the dotted lines. The display portion 30 can also be extended upwards and rotated so that the display faces the user, as shown in Figure 8B. Figure 8C shows a top view of the display portion 30 that has been extended outward and then rotated about pivot 62.

In one embodiment, contacts or sensors detect the position of the display portion 30 in order to present information to a user with the correct viewing orientation. For example, in the full I/O position of Figure 7B, the device would need to display information using an orientation that is opposite to that of the read mode of Figure 7A. Similarly, the device shown in Figures 8A-8C would need to detect the orientation of the display portion 30. This could be done by detecting the angle of rotation of the pivot points of the arm 60.

The present invention allows input via keyboard to a variety of different devices. For example, in one embodiment, a transmitter is added to communicate signals corresponding to characters input into the device via the keyboard, such as in a two-way pager or a cellular telephone application. In another embodiment, an optical system is added to capture one or more images, such as in a still or video camera application.

Thus, an electronic device having a display that conceals a keyboard is disclosed. The specific arrangements and methods described herein are merely illustrative of the principles of this invention. Numerous modifications in form and detail may be made without departing from the scope of the described invention. Although this invention has been shown in relation to a particular embodiment, it should not be considered so limited. Rather, the described invention is limited only by the scope of the appended claims.

CLAIMS

## WHAT IS CLAIMED IS:

1. A device comprising:
  - a keyboard for entering data into the device; and
  - a display to display information, wherein the display has a first position in which the display hides the keyboard, and the display has a second position in which the keyboard is exposed to allow entry of data, wherein the display is visible to a user in both the first position and the second position.
2. The device of claim 1, wherein selection of a key of the keyboard results in an input of one character into the device.
3. The device of claim 2 further comprising:
  - a transmitter to wirelessly communicate signals corresponding to characters input into the device via the keyboard.
4. The device of claim 3, wherein the device is a two-way pager.
5. The device of claim 3, wherein the device is a cellular telephone.
6. The device of claim 2 further comprising:
  - an optical system to capture one or more images.
7. The device of claim 1, wherein the information provided by the display is textual information.
8. The device of claim 1, wherein the information provided by the display is pictorial information.
9. The device of claim 1, wherein the display moves between the first position and the second position by sliding within a mechanical guide.

10. The device of claim 1 further comprising:
  - a base portion, the base portion comprising a processor, memory, and the keyboard, the base portion being connected to the display via an arm that pivots in multiple directions.
11. The device of claim 1 further comprising:
  - a base portion, the base portion comprising a processor, memory, and the keyboard, the base portion being connected to the display via a pivot point, the pivot point allowing the display to rotatably move from the first position to the second position.
12. The device of claim 1 further comprising:
  - an attachment means for mechanically and electrically coupling the display to the keyboard.
13. A device comprising:
  - a keyboard for entering information;
  - a display having a viewing surface, the display moveable to conceal the keyboard in a first mode or expose the keyboard in a second mode, the viewing surface being visible in both the first mode and the second mode.
14. The device of claim 13, wherein the display is a liquid crystal display (LCD).
15. The device of claim 13, wherein the keyboard includes a numeric keypad.
16. The device of claim 13, wherein selection of a key of the keyboard results in an input of one character into the device.
17. The device of claim 13, wherein the display provides textual and pictorial information.
18. The device of claim 13 further comprising:



a position detector to determine whether the display is in the first mode or the second mode.

19. A device comprising:

a keyboard for entering information;

a liquid crystal display (LCD) having a viewing surface, the LCD moveable to conceal the keyboard in a first mode and expose the keyboard in a second mode while allowing the viewing surface to remain visible to a user.

20. The device of claim 19, wherein selection of a key of the keyboard results in an input of one character into the device.

21. The device of claim 19 further comprising:

a transmitter to wirelessly communicate signals corresponding to characters input into the device via the keyboard.

22. The device of claim 21, wherein the device is a two-way pager.

23. The device of claim 21, wherein the device is a cellular telephone.

24. The device of claim 19 further comprising:

an optical system to capture one or more images.

25. A method of providing input to a device, the device having a read mode in which a display is visible but a keyboard is not accessible, the device having a full I/O mode in which the display is visible and the display does not physically block access to the keyboard, the method comprising:

moving the display from the read mode to the full I/O mode; and  
entering a character via the keyboard.

26. The method of claim 25 further wherein the moving the display is performed by slidably moving the display, wherein a portion of the display moves using mechanical guides.

27. The method of claim 25 wherein the moving the display is performed by rotatably moving the display, wherein the display rotates about a pivot point.

28. The method of claim 25 wherein the moving the display is performed by manipulating an arm connecting the display to the device.

29. The method of claim 25 further comprising:

detecting a position of the display; and

orienting an output of the display based on detecting the position of the display.

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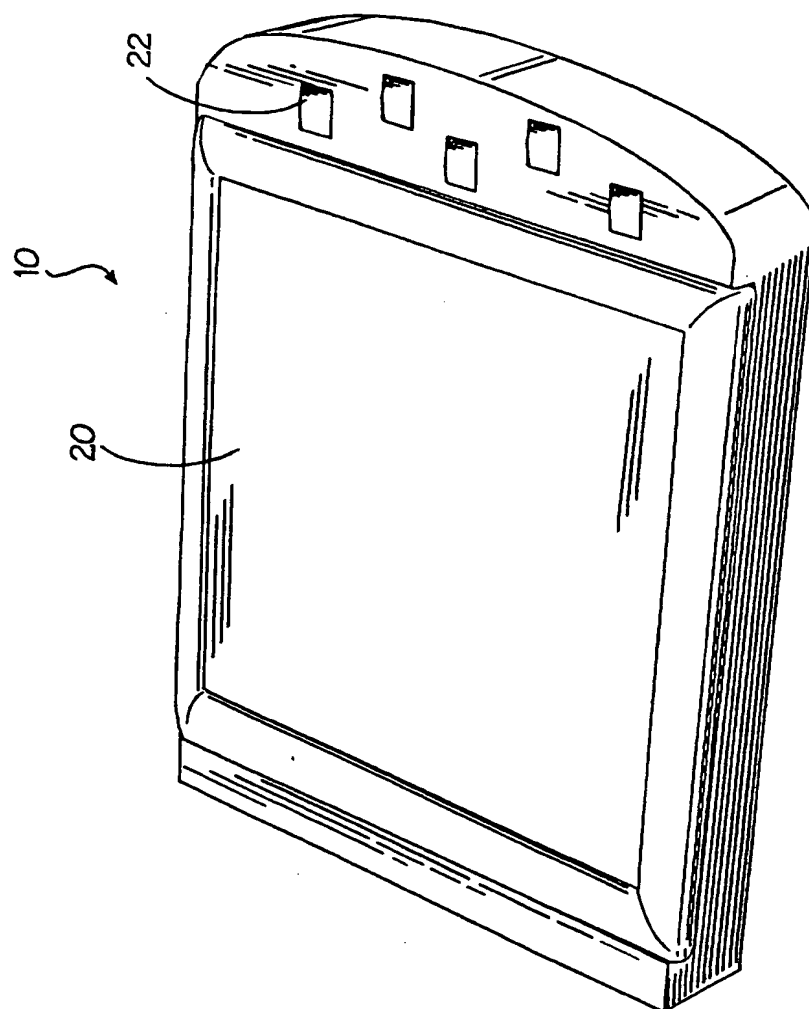
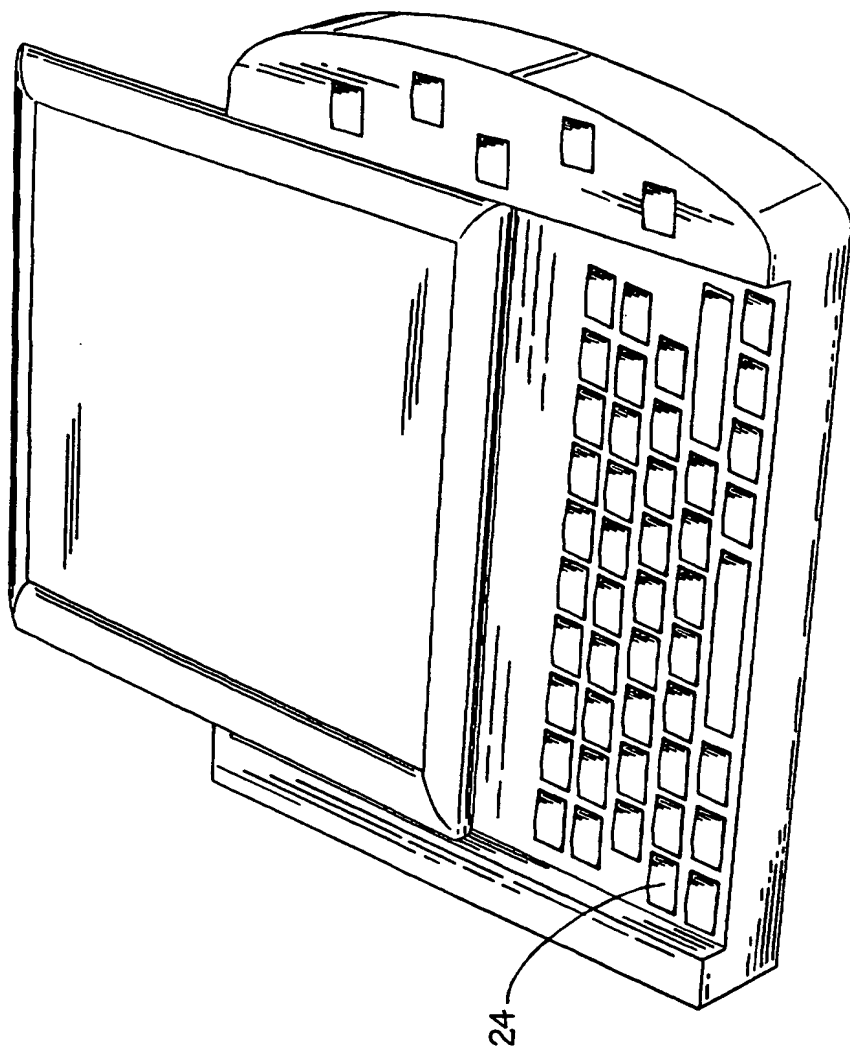


Fig. 1

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Fig. 2



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Fig. 3

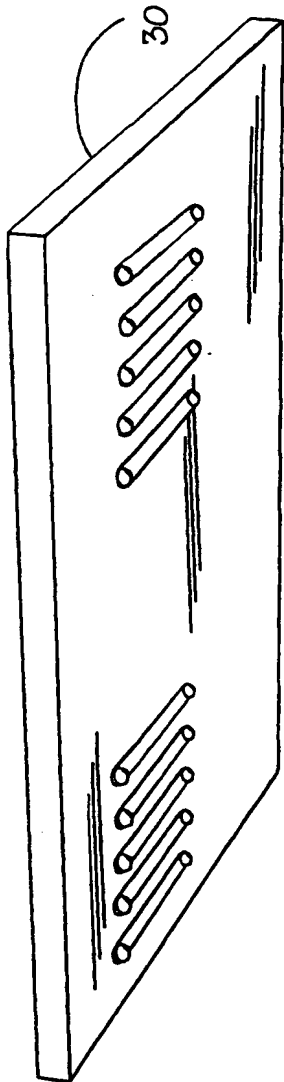
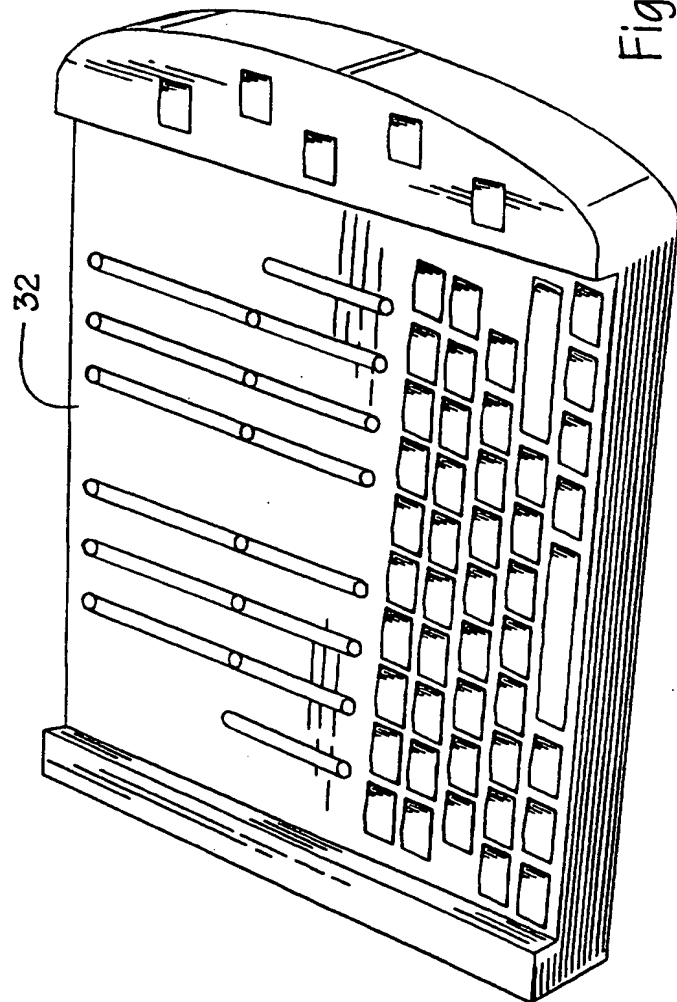


Fig. 4



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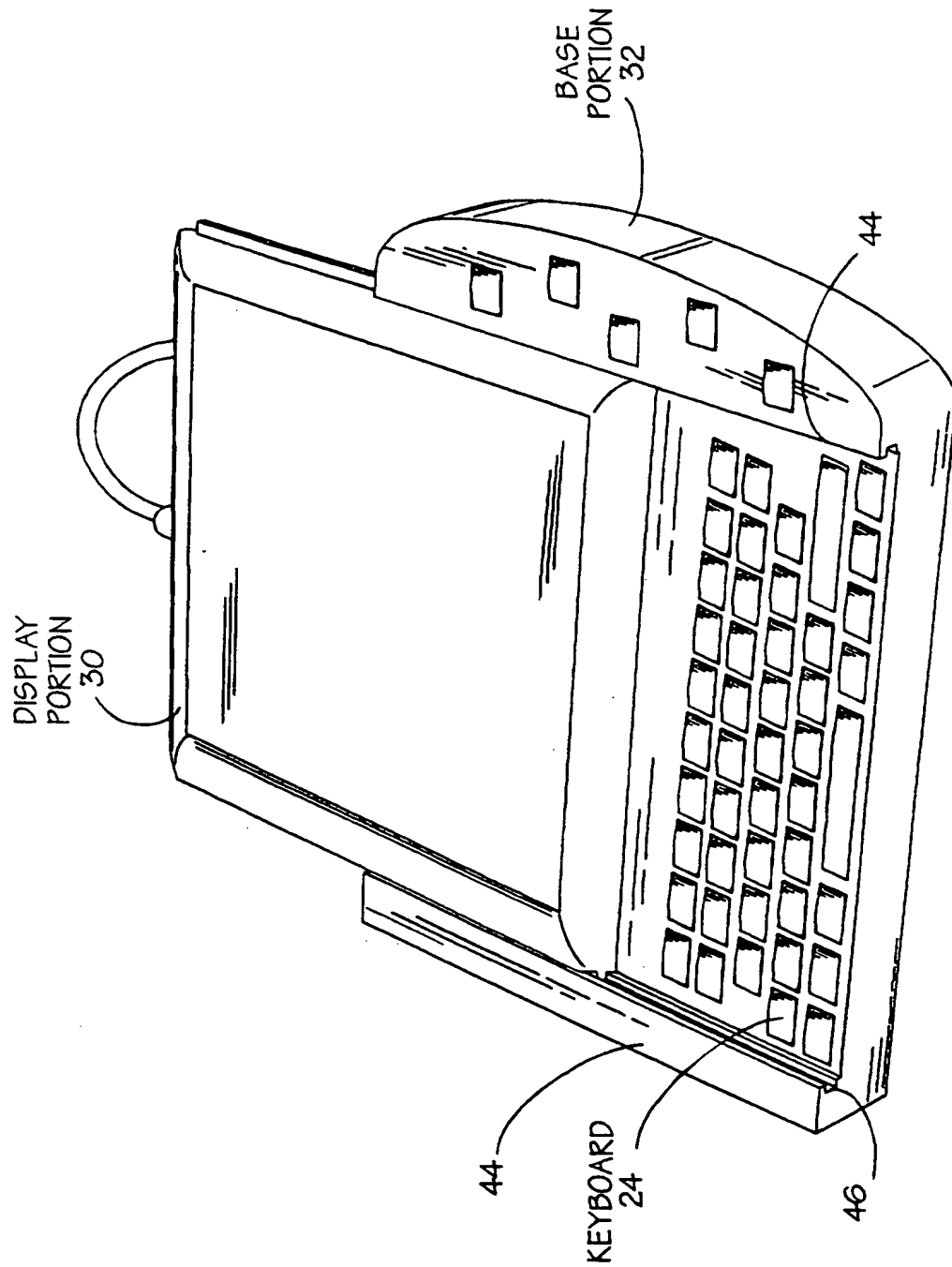
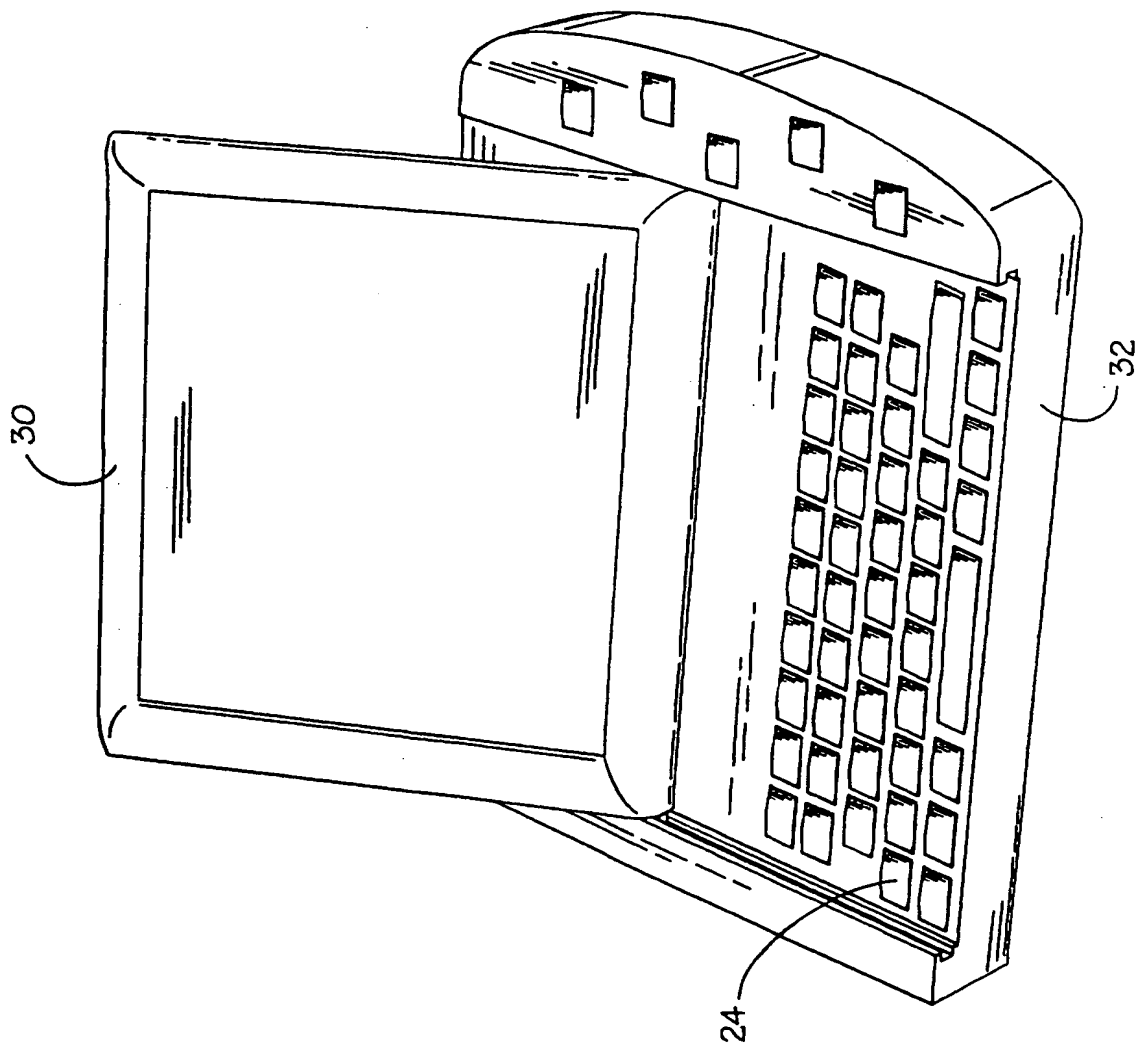


Fig. 5

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Fig. 6



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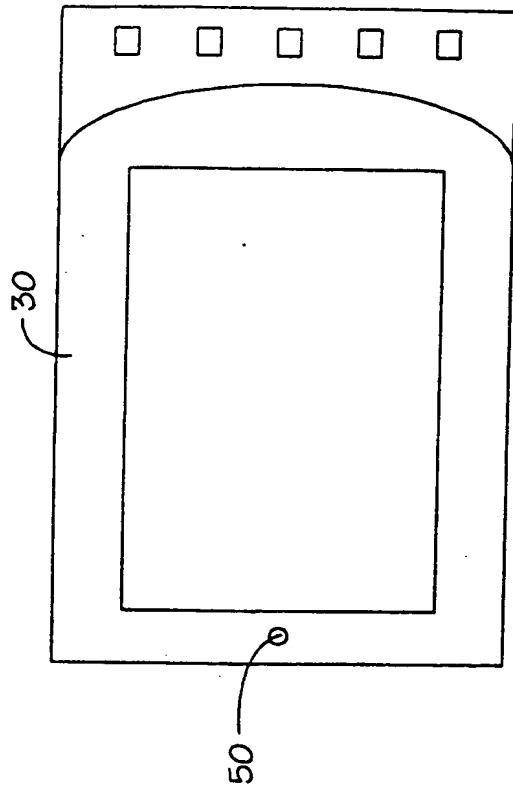


Fig. 7A

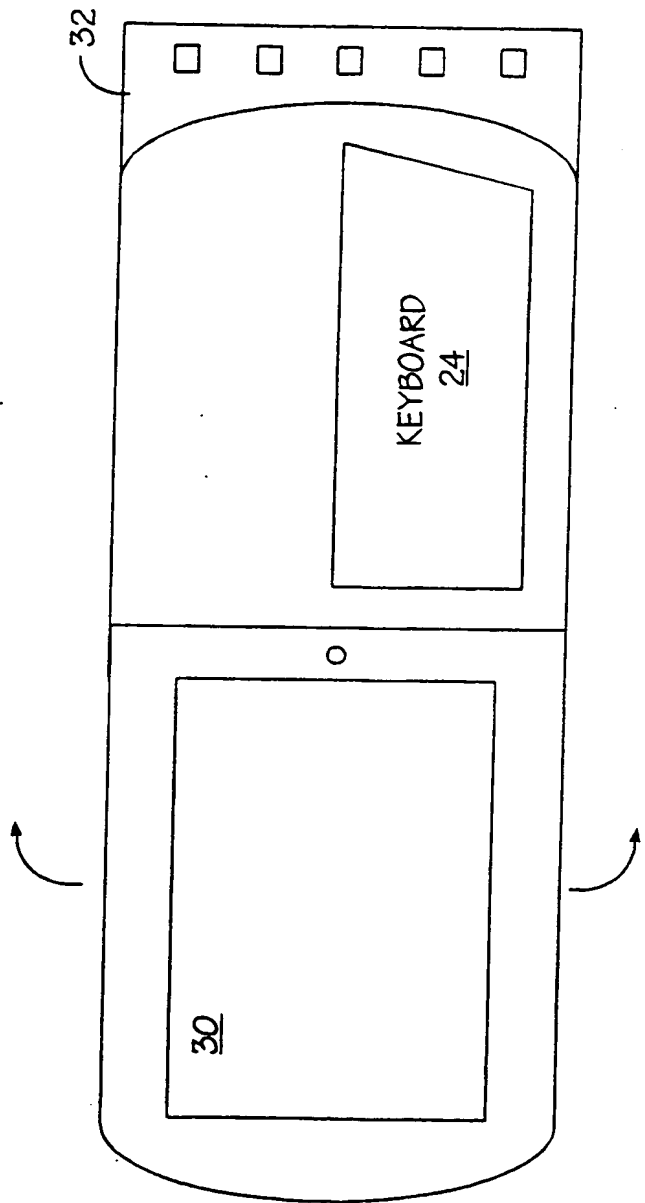


Fig. 7B



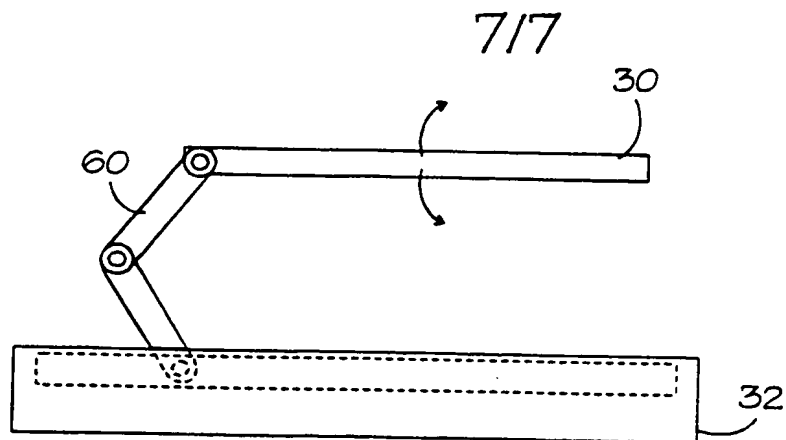


Fig. 8A

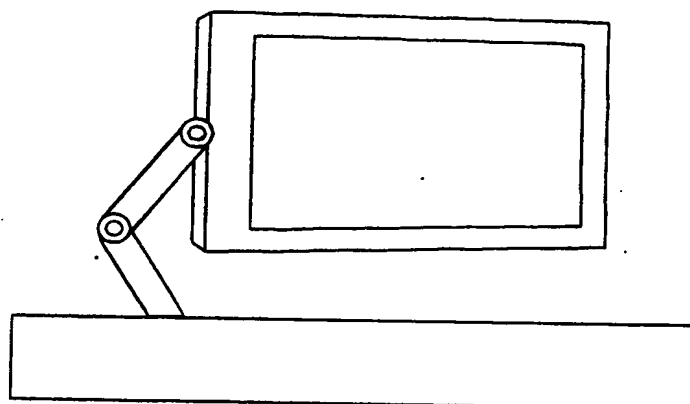


Fig. 8B

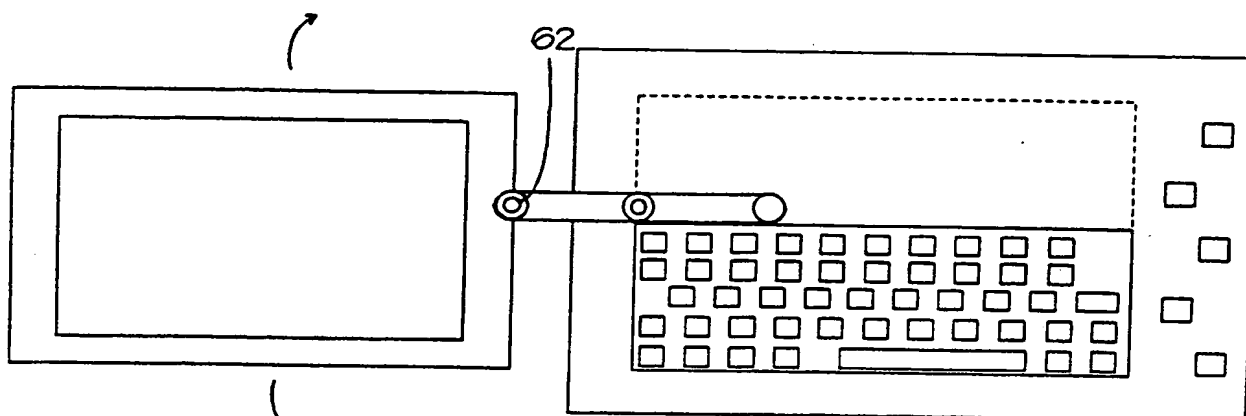


Fig. 8C

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US99/26864

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : H03M 11/00; H03K 17/94; G09G 5/00; H05K 5/00, 7/00

US CL : 341/20, 22; 345/168; 361/680, 681

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 341/20, 22; 345/168; 361/680, 681

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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WEST

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,644,469 A (SHIOYA et al) 01 July 1997, entire document	1, 7-17, 19-20, 25-28
X	US 5,278,779 A (CONWAY et al) 11 January 1994, entire document	1, 7, 8, 11, 12-17, 19, 20, 25, 27, 28
A	US 5,128,662 A (FAILLA) 07 July 1992	1-29
A	US 5,821,881 A (FISCHER et al) 13 October 1998	1-29
A	US 5,712,760 A (COULON et al) 27 January 1998	1-29
A	US 5,440,502 A (REGISTER) 08 August 1995	1-29



Further documents are listed in the continuation of Box C.



See patent family annex.

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